GAS LIGHTER

FIELD OF THE INVENTION

[0001] The present invention relates to gas cigarette lighters.

BACKGROUND OF THE INVENTION

[0002] More particularly, the invention relates to a gas cigarette lighter including a fuel reservoir, preferably made of an amorphous polymer material. The reservoir having a top wall through which a well passes, the well being provided with a gas dispensing device which includes a tubular element engaged in the well in leaktight manner.

[0003] The above-mentioned amorphous polymers are polymers having chains of monomers disposed in disordered or random manner, unlike semi-crystalline or crystalline polymers, in which the chains are disposed uniformly. Certain amorphous polymers offer advantages for making fuel reservoirs for lighters, with particular examples worth mentioning being the categories of acrylonitrile butadiene styrenes (ABSs) or of styrene acrylonitriles (SANs). Certain amorphous polymers are also transparent, which makes it possible to see the level of liquid fuel remaining in the reservoir. Amorphous polymers are also generally less expensive and easier to use than semi-crystalline polymers.

[0004] However, amorphous polymers are relatively brittle at ambient temperature because their elongation at the elastic limit is small, generally less than 5%.

[0005] Furthermore, typically, when using fuel reservoirs constructed out of amorphous polymers, complex fitting means must be used to fit the gas dispensing device in the top wall of such reservoirs. For example, WO 01/18452 A1 discloses a tubular element with an 0-ring gasket for sealing the tubular element in the well in the top wall of the reservoir. The tubular element being held in the well by means of a threaded ring that is screwed into a tapped portion of the well. This device suffers from having numerous and complex parts, which complicates assembly of the lighter, and thus increases its manufacturing cost and reduces its reliability. Furthermore, the large overall size of such a dispensing device limits the possibilities of miniaturizing the lighter.

SUMMARY OF THE INVENTION

[0006] The present invention provides a cigarette lighter with a top wall of the reservoir having an annular groove extending around the well, the top wall preferably is reinforced by a ring engaged in the annular groove. The ring preferably is formed on the head of the lighter which overlies the reservoir. A dispensing device having a tubular element is engaged in the well. The top wall forming an annular wall between the annular

groove and the well, the annular wall being clamped between the ring and the tubular element, so as to obtain sealing between the tubular element and the well by mutual contact only.

[0007] This provides a lighter with a relatively inexpensive reservoir since the reservoir can be constructed from an amorphous polymer, which provides excellent sealing because of the presence of the reinforcing ring engaged in the annular groove that surrounds the well. This reinforcing ring resists extension stresses in the top wall of the reservoir and in particular in the annular wall situated between the groove and the well, but also generates compression stresses in the annular wall, thereby resisting the formation of micro-cracks. Thus, the tubular element of the gas dispensing device is fitted in the well of the reservoir with improved sealing.

[0008] Furthermore, manufacturing of the present device is particularly simple because it is not necessary to use a separate gasket interposed between the wall and the tubular element, nor to use a screw-fastenable ring to affix the tubular element.

[0009] In addition, it is optionally possible to use any of the following provisions singularly or in combination:

[0010] the annular groove has a first annular face facing radially outwards, and the ring has a first annular face facing radially inwards and engaged in tight-fitting manner against the first annular face of the groove;

[0011] the annular groove has a second annular face facing radially inwards, and the ring has a second annular face facing radially outwards and engaged without being in a tight-fit with the second annular face of the groove;

[0012] the well, the tubular element, the ring and the groove are preferably in the shape of a cylinder that is circularly-symmetrical, the groove having a certain inside diameter, and the ring having an inside diameter that is preferably no larger than the inside diameter of the groove, the well having a certain diameter and the tubular element having a certain outside diameter that is preferably no smaller than the diameter of the well;

[0013] the groove has a certain outside diameter, and the ring has an outside diameter that is preferably no larger than the outside diameter of the groove;

[0014] the gas dispensing device preferably includes a regulating device and a valve that are received inside the tubular element;

[0015] the lighter is preferably provided with a head that overlies the reservoir, which preferably includes an ignition device and a control device for controlling the gas dispensing device, the ring preferably being part of the head of the lighter;

[0016] the head and the ring are preferably formed as a single piece made of a semi-crystalline polymer material;

[0017] the tubular element preferably is forced-fitted into a hole provided in the head;

[0018] the tubular element is preferably made of metal and has an internal shoulder against which a micro-porous disk is held by a retaining ring, the tubular element having one end crimped against the retaining ring;

[0019] the reservoir preferably has a side wall against which the top wall is bonded; and

[0020] the reservoir preferably is formed of a material chosen from ABS and from SAN.

[0021] Other characteristics and advantages of the present invention will become readily apparent to those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Figure 1 is a vertical cross sectional view of an embodiment of a cigarette lighter of the invention; and

[0023] Figure 2 is a fragmentary enlarged view of the cross sectional view of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] In the figures, the same references are used to designate identical or similar elements.

[0025] For the purpose of promoting an understanding of the principles of the present invention, reference will now be made to an exemplary, non-limiting embodiment illustrated in Fig. 1. As shown, the gas cigarette lighter **1** includes a reservoir **2** intended to contain a fuel under pressure and partially in the liquid phase, such as, for example, isobutane.

[0026] In the embodiment shown, the reservoir **2** is formed of a bowl **3**, the bowl preferably being U-shaped in cross section, and having a bottom wall **4** and an annular side wall **5** that extends upwards from the bottom wall **4** to a top end **6**.

[0027] The top end **6** may be closed off by a top wall **7** which, in the example shown, may be a separate part fixed by any method known in the art including, but not limited to bonding, gluing, welding, friction or press fit, etc., to the side wall **5**. Alternatively, the top wall **7** may be manufactured as an integral part with the bowl **3**.

[0028] The reservoir **2** preferably is manufactured from at least one amorphous polymer material, including, for example, from acrylonitrile butadiene styrenes (ABSs), styrene acrylonitriles (SANs), etc. Alternatively, by way of example, the bowl **3** may be manufactured from SAN, and the top wall **7** may be manufactured from ABS, and vice versa, it being possible, in known manner, to bond these materials together, for example, by ultrasonic sealing, bonding, ultrasonic welding, gluing, etc.

[0029] As previously stated, the advantage of such amorphous polymers is that they are relatively inexpensive, and easy to implement, process, manufacture and form parts from. In addition, certain amorphous polymers, such as SANs, may be transparent, making it possible for the cigarette lighter user to see the level of liquid fuel remaining in the reservoir **2**.

[0030] Other amorphous-type polymers may also be used, provided that their mechanical and chemical properties are compatible with them being used as a gas lighter reservoir.

[0031] To accommodate the gas pressure prevailing inside the reservoir **2**, the bowl **3** and the top wall **7** may have walls that are relatively thick, and the bowl **3** may optionally be provided with a bridge **8** that extends vertically from the bottom wall **4** while interconnecting two opposite faces of the side wall **5**.

[0032] The top wall **7** preferably may further be provided with a well **9** that in the example shown, extends vertically and which may preferably be in the shape of a cylinder that is circularly symmetrical. The well **9** preferably being capable of receiving a gas dispensing device **10**, which includes a tubular element **19**, which is preferably made of metal and also in the shape of a cylinder that is circularly symmetrical.

[0033] The gas dispensing device **10** preferably is actuated by a control device **11** that is carried on the head **12** of the lighter, the head 12 of the lighter overlying the reservoir **2** as shown. Preferably, as shown, the head **12** is retained against the top wall **7** of the reservoir **2** by catches **17** (*i.e.*, studs) on the head **12** that co-operate by snap-fastening or clipping with complementary catches **18** molded in the top wall **7** of the reservoir 2.

[0034] The head **12** may also form a support for fitting an ignition device **14** and a windshield **13** forming a screen or shield against the wind or draft. The ignition device **14**, which are generally known in the art, may comprise, for example, a serrated friction wheel **15** and a flint **16** held pressed against the serrated friction wheel **15** by a spring received in a cavity in the head **12**. A complementary cavity is formed in the top wall 7 of the reservoir 2 to accommodate the cavity of the head **12**. However, it is of course possible to use other types of ignition devices **14**, such as a piezoelectric device, etc.

[0035] The dispensing device **10** may further include: a regulating device for regulating the gas flow rate, which device may, for example, comprise a microporous disk **20**. The microporous disk **20** preferably is manufactured by a uniaxially stretched polypropylene film provided with slot-like pores, as described in United States Patent No. 4,496,309 the disclosure of which is incorporated herein by reference. The microporous disk **20** preferably is disposed within the bottom portion of the tubular element **19**.

[0036] Preferably, the microporous disk **20** is held against an internal shoulder **21** in the tubular element **19**, the shoulder **21** being formed in the vicinity of the bottom end of the tubular element **19**. The microporous disk **20** covers an orifice **21a** formed in the center of the shoulder **21**. The microporous disk **20** is preferably pressed against the bottom face of the shoulder **21** by a retaining ring **22**, which is itself retained at the bottom portion of the tubular element **19** by crimping the bottom end **23** of the tubular element **19**.

[0037] The dispensing device **10** preferably also includes a valve **24** having a gas outlet duct **27** opening near the ignition means **14**. The valve being formed by a tubular hollow body **25** which, in its bottom portion, preferably carries closure means such as an elastomer disk **26** adapted to shut off the above-mentioned orifice **21a** as the duct is moved along the longitudinal axis of the tubular element **19**. The hollow body, which defines the gas outlet duct **27**, communicates with the inside of the tubular element **19** via slots **28**, etc. provided in the hollow body.

[0038] The valve and the regulating device for regulating the gas flow rate are preferably received inside the tubular element **19**.

[0039] Preferably the lighter also includes a control device **11**. The control device **11** preferably includes a fork mounted to tilt about a pin secured to the head **12**. A first end **31** of the fork cooperates with a setback **32** formed on the top portion of the hollow body **25**, which emerges from the tubular element **19** thus permitting the gas dispensing device **10** to be raised as the user depresses the second end **33** of the fork. When the user depresses the second end **33** of the fork raising the hollow body, the valve is opened releasing gas from the reservoir **2**.

[0040] Preferably, a compression spring **34** is disposed between the bottom face of the second end **33** of the fork and the bottom **35** of a well formed in the head **12**.

[0041] As shown in more detail in Figure 2, the tubular element **19** of the dispensing device **10** preferably is engaged in the well **9**.

[0042] In addition, around the well **9**, the top wall **7** of the reservoir **2** is provided with an annular groove **36** which may, for example, be in the shape of a cylinder that is circularly-symmetrical and which opens upwards. A reinforcing ring **37** is engaged in the

annular groove **36** so that the annular wall **38** that separates the groove **36** from the well **9** is clamped between the ring **37** and the tubular element **19**. This clamping provides sealing between the well **9** and the tubular element **19** merely by contact between these two parts, without requiring an additional gasket.

[0043] Preferably, the annular groove **36** and the ring **37** are concentric with the well **9** and with the tubular element **19**.

[0044] Preferably, the tubular element **19** is engaged in snug or tight fitting manner into the well **9**, while the annular face **39** of the ring **37** that faces radially inwards is engaged in tight-fitting manner against the annular face **40** of the annular groove **36** that faces radially outwards. The tight-fitting engagement of the ring **37** in the groove **36** compressing the annular wall **38** against the tubular element **19** without generating any extension stress in the annular wall **38**. It should be noted however that it is possible to have some clearance (a few hundredths of a millimeter) between the tubular element **19** and the well **9**.

[0045] Preferably, the annular face **41** of the ring **37** that faces radially outwards is engaged without being in a tight-fit with the annular face **42** of the groove **36** that faces radially inwards.

[0046] More precisely, the outside diameter of the tubular element **19** preferably is at least equal to and more preferably substantially equal to the inside diameter of the well **9**; the inside diameter of the ring **37** preferably is less than (*e.g.* about 3 to 12 hundredths of a millimeter less than) the inside diameter of the groove **36**; and the outside diameter of the ring **37** preferably is not more than, and more preferably less than the outside diameter of the groove **36** so that the ring **37** does not generate any extension stresses in the portion of the top wall **7** that is situated outside the groove **36**.

[0047] These various provisions make it possible for excellent sealing to be obtained between the tubular element **19** and the well **9**.

[0048] Preferably, the material of which the ring **37** is made must be relatively rigid and capable of withstanding a relatively large amount of elongation, preferably greater than 5%. By way of example, the ring **37** preferably is made of a semi-crystalline polymer material, *e.g.* polyoxymethylene (POM) or polyamide, *e.g.* of the 6-6 type.

[0049] For the purpose of reducing the number of parts, the ring **37** may preferably be made integrally with the head **12** and of semi-crystalline material. Furthermore, using semi-crystalline material makes it possible to fit the tubular element **19** simply by force fitting the tubular element **19** into a hole **43** in the head **12**.

[0050] Naturally, this embodiment is in no way limiting, and, in particular, it is possible to make the head **12**, the ring **37**, and the tubular element **19** integrally, and either of metal or of semi-crystalline polymer.

[0051] The present invention has been described in connection with the preferred embodiments. These embodiments, however, are merely for example and the invention is not restricted thereto. It will be understood by those skilled in the art that other variations and modifications can easily be made within the scope of the invention as defined by the appended claims, thus it is only intended that the present invention be limited by the following claims.